SAMUEL EDWARD PEAL.

SAMUEL EDWARD PEAL, who died at Moran, Sibsagur, Assam, on July 29, was born December 31, 1834. Originally an artist, he went to India in 1862 as a tea planter, and it was while so engaged in 1873 that he discovered that the tea blight was due to the ravages of a kind of Aphis, "the tea bug of Assam," since named the *Helopelta theovora*, the life-history of which he worked out with suggestions for its extermination.

He was a Fellow of the Royal Geographical Society and of other Societies, and did good service in exploration among the Naga Hills, mainly with a view of showing the practicability of a direct route from India to China (the old Burmese route) over the Patkoi range, a work much appreciated by the Indian Government.

As a philologist his acquaintance with the various dialects of the hill men, and his great tact in dealing with them, made his presence acceptable where others had failed.

He devoted many years to the study of the grasses and trees of Assam and their life-histories, and had completed and profusely illustrated his work upon them, when the bungalow (during his absence) was destroyed by fire with all its contents, and his many years of labour wasted.

Astronomy of late years occupied his attention, and his theory of lunar surfacing as due to glaciation is gradually becoming accepted. He also wrote a paper "On a Possible Cause of Lunar Libration, &c." He was a frequent contributor to the Indian press, and also to the columns of NATURE, on various natural history subjects, and had recently traced the connection between the Dyaks of Borneo and some aboriginals of Assam. Having resided thirty-five years in Assam, he was considered the *doyen* of the Europeans of the province, and being held in high esteem, his loss will be severely felt.

NOTES.

THE concluding general meeting of the British Association at Toronto was held on Wednesday, August 25. Special thanks were accorded to Prof. Macallum, the leading local secretary, for the active share he had taken in making the meeting such a very successful one. The total attendance at the meeting was announced as 1362. The *Times* correspondent reports the following facts of interest:—Among the important new grants are 50*l.* towards the Meteorological Observatory in Montreal, 75*l.* for the biology of the lakes of Ontario, 125*l.* for the anthropology and natural history of Torres Straits, 100*l.* for the investigation of changes associated with the activity of nerve cells—total grants, 1350*l.* A new committee of great importance has been appointed. The Council was requested to consider the desirability of approaching the Government with a view to the establishment in Great Britain of experimental agricultural stations similar in character to those which are producing such satisfactory results in Canada. The committee is to report on the means by which in various countries agriculture is advanced by research, by special educational institutions, and by the dissemination of information and advice among agriculturists. The Association is to meet in Bristol next year, and in Dover in 1899.

THE Chancellor of the Exchequer has informed the executors of the late Sir Wollaston Franks that he will remit the estate duty on the bequest to the British Museum of the valuable collections and books which he left to it on that condition (see p. 275). The collection has therefore now been handed over.

IT is reported that the Duke of the Abruzzi (Prince Luigi of Savoy) and his party reached the summit of Mount St. Elias, at an altitude of 19,000 feet, on July 31. The expedition, which was the most successful that has ever undertaken the ascent of Mount St. Elias, passed fifty-one days on the ice and snow. It is stated that the explorers declare that they did not see the slightest indication that Mount St. Elias had been volcanic.

THE Committee on Indexing Chemical Literature presented its fifteenth annual report to the American Association for the Advancement of Science at the recent meeting. From the report we learn that a bibliography of the metals of the platinum group, 1748–1896, by Prof. James Lewis Howe, and a review and bibliography of metallic carbides, by Mr. J. A. Mathews, have been completed, and have been recommended to the Smithsonian Institution for publication. A bibliography of basic slags, technical, analytical and agricultural, has been completed by Karl T. McElroy. The channel of publication has not been determined. The second edition of the catalogue of scientific and technical periodicals, 1665–1895, by Dr. H. Carrington Bolton, is entirely printed, but has not yet been published. The new edition contains 8603 titles. A supplement to the select bibliography of chemistry, 1492–1896, has also been completed by Dr. Bolton, who has presented the MS. to the Smithsonian Institution. This supplement contains about 9000 titles, including many chemical dissertations, and is brought down to the end of the year 1896. Progress is also being made with an index to the literature of thorium; an index to the literature of tantalum; a bibliography of oxygen; and a bibliography of the constitution of morphine and related alkaloids. Letters for the Committee should be addressed to the Chairman, Dr. H. Carrington Bolton, at Cosmos Club, Washington, D.C.

MORE than seven thousand members attended the twelfth International Medical Congress held at Moscow on August 19–26. From a report in the *Lancet*, we learn that the Grand Duke Sergé Alexandrovitch officially opened the Congress on August 19, in the presence of a brilliant assembly; Count Delianof then delivered a short address of welcome in the Latin tongue. Prof. Sklifosovski, president of the organising committee, also delivered an address. Prof. Roth, the general secretary, then gave an account of the preliminary labours of the organising and executive committees. The recent Congress was larger than any of its predecessors, the number of members exceeding 7300, more than half of whom came from abroad. Prince Galitzin, the Mayor of Moscow, welcomed the members of the Congress in the name of the city of Moscow, and added that to commemorate the event the municipality had decided to offer a triennial prize for the best work on some selected medical subject. After brief addresses by the delegates of the different countries represented at the Congress, Prof. Virchow gave an address upon "The Continuity of Life as the Basis of Biological Science." The second address was by Prof. Lannelongue, who had for his subject "The Surgical Treatment of Tuberculosis." Dr. Lauder Brunton then read an address on "The Relations between Physiology, Pharmacology, Pathology, and Practical Medicine." This address is printed in the current number of the *Lancet* (August 28).

THE sixty-fifth annual meeting of the British Medical Association was opened at Montreal on Tuesday. This is the first occasion on which the Association has met outside the British Isles. About two thousand delegates from all parts of the British Empire are attending the meeting. The French Government sent Dr. Charles Richet as its official representative, and about four hundred leading American physicians are present. The opening meeting took place on Tuesday afternoon. The Mayor of Montreal welcomed the Association on behalf of the city; while Sir A. Chapleau, French Canadian Lieutenant-Governor, and Lord Aberdeen, expressed the welcome of the province and the Dominion respectively. Dr. T. G. Roddick, Professor of Surgery in the McGill University, and president of the Association, then delivered an address on the objects of the

Association, Canadian climatology, and the state of medical education in Canada. A vote of thanks for the address was proposed by Lord Lister, and seconded by Sir James Grant. Upon the evening of Tuesday Prof. Richet delivered a lecture upon Pasteur and his work.

THE annual general meeting of the Federated Institution of Mining Engineers will be held in Edinburgh on September 14-16. The following papers are among those to be read or taken as read :—"Submarine Coal-mining at Bridgeness," by Mr. Henry M. Cadell. "Alternating Multiphase Machinery for Electric-power Transmission," by Mr. Walter Dixon. "Observations on some Gold-bearing Veins on the Coolgardie, Yilgarn, and Murchison Gold-fields, Western Australia," by Mr. Edward Halse. "The South Rand Coal-field and its connection with the Witwatersrand Banket Formation," by Mr. A. R. Sawyer.

IN the *Atti dei Lincei*, vi. 2 (July 18), Dr. Calandruccio and Signor Grassi give a brief account of their latest observations on the metamorphoses of the Murienoids. The authors have followed the transformation into the cæcal stage of several *Leptocephalus brevirostris* having their larval teeth still intact. This transformation takes place without the animal burying itself in sand. It is noteworthy, too, that the anterior and posterior extremities of the body have already acquired nearly all the characteristics of the cæcal stage when the remainder of the body is still far from possessing them. The Leptocephaloids of *Myrus vulgaris* are very similar to those of *Ophichthys hispanus* (= *O. remicaudus*). The Tiluroids may in all probability be referred to *Serrivomer*. Dr. Calandruccio and Signor Grassi have now observed the larval and semi-larval stages of all the Murenoids of the Mediterranean, with the exception of the very rare *Chlopsis bicolor* and the occasional *Murænesox savanna.*

A METHOD of determining the heights of clouds, and especially of the ill-defined stratus cloud, by means of the search light, was suggested by Prof. Cleveland Abbe many years ago. It was proposed to establish a search light, the beams of which should be vertical; the apparent altitude of the centre of the luminous spot of the cloud was to be observed from a station not far away, and the height was a matter of easy calculation. Prof. Abbe returns to the subject in the *Monthly Weather Review* (May), and points out that with the great increase in the power of the modern search light, further applications have become practicable; thus in harbours on the sea-coast, where one wishes to ascertain the presence and development of low-lying fogs, the search light which renders them visible is an invaluable assistant. A year ago some accounts were published relative to the cloud effects on Mount Low and Pasadena. According to these accounts Mount Low is about 15 miles north-north-east from Los Angeles, and about 6 miles in a straight line from Pasadena. When the beam of light fell upon the bodies of clouds they at once became luminous, so that all the details of motion were visible; when the beam fell upon the falling rain, the great cone of light glowed like molten metal. It seems, concludes Prof. Abbe, that the formation and motion of fog and cloud at night-time could be advantageously studied by means of the search light. The height at which fog first forms, and its gradual extension upwards and downwards during the night, would be a very interesting and profitable investigation.

THE disturbance of submarine cable working by electric tramways forms the subject of a paper by Mr. A. P. Trotter in the *Journal* of the Institution of Electrical Engineers. As soon as the electric tramway service was started at Cape Town, the working of the syphon recorder of the submarine cable of the Eastern and South African Telegraph Company was found to be seriously affected. When the tramcars were started and when they were stopped, "kicks" were recorded by the syphon recorder, and these being superimposed upon the received signals made it difficult and often impossible to read the message. The first mile of the cable was at a mean distance of about half a mile from the tramway. After a long series of experiments Mr. Trotter found that the only way to cancel the disturbances was to lay a new cable of about five miles long as nearly as possible over the old one, the cable terminating in an earth plate. As soon as this had been done the traffic was resumed, and no appreciable disturbances of the recorder took place. In the discussion upon the paper, Mr. W. H. Preece said that similar disturbances occurred wherever electrical tramways, and telegraphs, submarine or overland, existed together. Prof. Ayrton gave an account of observations of magnetic disturbances over the whole neighbourhood of the City and South London Electric Railway, which runs underground between London Bridge and Stockwell. The suspended magnet used in the investigation showed that disturbances of the earth's magnetic field occurred throughout the whole region of the line, and were caused either by magnets or masses of iron in the passing trains, or by currents passing through the earth.

AMONG many other papers in the *Proceedings* of the Indiana Academy of Science, dated 1894, but only just received, is one by Mr. D. T. MacDougal, showing that various species of Cypripedium have an irritant action upon the human skin. It was found that when the leaves of *C. spectabile* were rubbed lightly upon the skin of the wrist, arm, face, or ear, the person experimented upon was usually "poisoned" in a degree corresponding to the manner of application, and in a time varying from ten to twelve hours. There could be no doubt about the unpleasant effects produced by the leaves, for Mr. MacDougal soon found that he could not obtain subjects willing to sacrifice their feelings upon the altar of scientific knowledge. He was able to prove, however, that similar painful effects were produced by *C. pubiscens* and *C. parviflorum.* To ascertain whether the effect was due to the mechanical injury resulting from piercing the skin by the pointed hairs upon the leaves, or to the corrosive action of the secretion found on the outside of the globular tips of the glandular hairs, separate tests were made by material from *C. spectabile.* The hairs of each kind were taken from the leaf by means of a pair of fine forceps, and the tip pressed against the skin. Irritation was found to result from the contact of the glandular hair only. It was found, further, that the irritant action of the plant increased with the development of the plant, and reached its maximum with the formation of the seed-pod, from which it is inferred that this is a device for the protection of the reproductive bodies during the period from pollination to the maturity of the seeds.

THE *Sitzungsberichte der Physikalisch-medicineschen Societät in Erlangen* for 1896 contains a paper, by M. Willibald Hoftmann, on the forces exerted by an electric field on an incandescent electric lamp, through which a current is flowing. When a highly exhausted vacuum tube is placed in the neighbourhood of such a lamp, it is found that, with discharges of moderate frequency, the filament begins to oscillate; more rapid discharges, however, impart to the filament a certain rigidity of position, which causes it to tend to maintain a fixed distance from the discharge-tube when the lamp is moved about. The author investigates the cause of these phenomena.—The same volume contains papers by Alfred Bettinghaus, on the geology of the Rathsberg plateau; by Dr. Gotthold Fuchs, on certain aniline derivatives and their physiological action; by Dr. Fritz Glatzel, on the alkalimetry of the blood; and by Dr. Joseph Rosenthal, on Röntgen rays.

Those interested in the properties of kathodic and allied rays, will find quite a series of papers in the last five numbers of the *Atti della R. Accademia dei Lincei*. Among these we would call especial attention to the following:—On the action of electricity on the discharging property induced in air by x-rays, by Prof. E. Villari (vol. vi. part 1, p. 343).—On the penetrating power of the same rays, by A. Ròiti (*ibid.* p. 354).—On electric discharge in gases, and on certain phenomena of electrolysis, by Vito Volterra (*ibid.* p. 389), dealing with phenomena allied to those observed by Sella and Majorana, in connection with the action of Röntgen and ultra-violet rays on the electric spark.—On the electrostatic charges generated by kathodic rays, by Q. Majorana (vol. vi. part 2, p. 16), who finds that the emanation of kathodic rays depends to a certain extent on the position of the anode.—On the discharging action of air after being traversed by x-rays, by Dr. Adolfo Campetti (*ibid.* p. 43), who considers that the so-called effects of dispersion by air, modified either by x-rays or by combustion, depends on a temporary increase in the conductivity of the gas.—On the non-penetration of electric waves into the space enclosed by a metallic shell, by Prof. Augusto Righi (*ibid.* p. 59).—On the velocity of kathodic rays, by Q. Majorana (*ibid.* p. 66), who obtains values for the velocity ranging from 100 to 600 kilometres per second.—On the double refraction of wood for electro-magnetic waves, by Prof. Domenico Mazzotto (*ibid.* p. 73), who finds (*a*) that the index of refraction varies considerably in different woods, and increases with the density; (*b*) that in the same wood electric oscillations perpendicular to the fibres are propagated more rapidly than those parallel to the fibres, and, hence, the index of refraction is less for the former; (*c*) that the difference between the two indices is less for dense than for light woods.

The action of light on various kinds of yeasts has lately been elaborately investigated by W. Lohmann. Kry has shown that the division of the cell in the case of *Sacch. cerevisiæ* takes place as vigorously in the presence of moderate light as in the dark, but the action of intense light upon this and other varieties of yeast has been studied by Lohmann. Exposure to the electric light, 11,590 candle-power, was found to exert a distinctly retarding action on the multiplication of these yeast cells. The sun's rays were, however, much more detrimental to their vitality, for after several hours' direct and uninterrupted insolation in the months of May and June, the rise in temperature being prevented by immersion of the agar-dishes containing the yeast cells in water, the latter were entirely destroyed. On the other hand, yeast cells kept in the dark during the same period of time, or only exposed intermittently to feeble sunshine, exhibited distinct multiplication. A microscopic examination revealed also a striking morphological difference between the cells kept in the dark and those which had been insolated. Whereas the former presented a perfectly normal appearance, the latter looked shrunken, exhibited irregular contours, and the plasma was drawn together in lumps, chiefly in the direction of the poles of the cells. Similar insolation experiments on other varieties of yeast exhibited the same lethal effect produced on these organisms by prolonged exposure to direct sunshine.

A new edition (the fourth) of Mr. Howard Collins' "Epitome of the Synthetic Philosophy of Herbert Spencer" (Williams and Norgate) has just been published. Mr. Spencer contributes a brief introduction to the volume, which is now a representation in miniature (if the word can be applied to a volume of nearly seven hundred pages) of the whole of his philosophy.—Dr. Max Verworn's "Allgemeine Physiologie" (Jena: Gustav Fischer), the first edition of which appeared early in 1895, has reached a second edition. Shortly after the original work appeared, its scope and many valuable qualities were described in these columns (vol li. p. 529). The volume has been thoroughly revised, and will doubtless pass through many more editions. English and Italian translations are being prepared. A Russian edition appeared some time ago, but Dr. Verworn states that it was published without his authority.

The following are among the articles and other publications which have come under our notice within the past few days:—"On the Development and Structure of Dental Enamel," by Dr. J. Leon Williams, in the *Journal* of the Royal Microscopical Society (August). The paper is illustrated with several excellent photo-micrographs showing various phases of enamel development.—The Chemical Society has just issued the annual supplementary number of its *Journal*, containing title-pages, contents, and indexes of volumes lxix. and lxx. (1896). To chemists this record of contributions to chemistry must be invaluable.—Following other scientific instrument-makers, Messrs. Howard B. Little and Co. have prepared and issued an illustrated list of apparatus and accessories for work with Röntgen rays. Persons who require an efficient outfit at a reasonable price should see Messrs. Little's list.—A description of the various forms of Australian bullroarers, accompanied by illustrative drawings, is contributed to the *Journal* of the Anthropological Institute (August), by Mr. R. H. Mathews. The same publication contains papers on the Berbers of Morocco, by Mr. W. B. Harris; Káfiristan and its people, by Sir George Scott Robertson; and further discoveries of ancient stone implements in Somaliland, by Mr. H. W. Seton-Karr.—In the *Journal* of the Royal Horticultural Society (August) are papers on the study of microscopic organisms, and its importance to horticulturists, farmers, and foresters, by Prof. Marshall Ward, F.R.S.; diseases of plants, by Mr. George Massee; and the physiology of pitcher-plants, by Prof. Sydney H. Vines, F.R.S.—Dr. C. M. Aikman has sent us a pamphlet on "Sixty Years of Agricultural Science," reprinted from the *Agricultural Gazette.—The Quarterly Journal* of the Royal Meteorological Society (July), just issued, contains a report of a lecture by Mr. G. J. Symons, F.R.S., on "Meteorological Instruments in 1837 and in 1897," with plates illustrating the types of instruments employed sixty years ago and now in meteorological observations.

The additions to the Zoological Society's Gardens during the past week include a Mozambique Monkey (*Cercopithecus pygerythrus*) from South-east Africa, presented by Mrs. Charlesworth; five Australian Bush Rats (*Mus arboricola*) from New South Wales, presented by Mr. Edgar R. Waite; two Egyptian Kites (*Milvus ægyptius*) from South Africa, presented by Mr. G. A. Ogilvie; a Mountain Ka-Ka (*Nestor notabilis*) from New Zealand, presented by Mr. Arthur Hope; two Ravens (*Corvus corax*), British, presented by Mr. W. B. Bingham; a Turtle Dove (*Turtur communis*), British, presented by Miss Mallard; a Purple Sunbird (*Cinnyris asiaticus*) from India, presented by Mr. Frank Finn; a Tawny Owl (*Syrnium aluco*), British, presented by Mr. C. Hastings Bostock; two Ring-necked Parrakeets (*Palæornis torquatus*) from India, presented by Miss M. Parsons; a European Pond Tortoise (*Emys orbicularis*), European, presented by Mr. F. E. Bastian; a Goliath Beetle (*Goliathus druryi*) from the Gold Coast, presented by Mr. W. Durham Hall; a —— Spider (*Mygale*, sp. inc.) from South Africa, presented by Mr. Rowland Ward; a Feline Genet (*Genetta felina*), a Delalande's Lizard (*Nucos delalandii*), a Puff Adder (*Bitis arietans*), a Cape Bucephalus (*Dispholidus typus*), a Rough-keeled Snake (*Dasypeltis scabra*), two Rhomb-marked Snakes (*Trimerorhinus rhombeatus*), an Infernal Snake (*Boodon infernalis*), two Lineated Snakes (*Boodon lineatus*), a Rufescent

Snake (*Leptodira hotambœia*), three Crossed Snakes (*Psammophis crucifer*) from Port Elizabeth, South Africa, presented by Mr. J. E. Matcham; a Brown Capuchin (*Cebus fatuellus*) from Guiana, deposited; a Rough Fox (*Canis rudis*) from Guiana, two Black-throated Weaver Birds (*Ploceus atrigularis*), two Bengal Weaver Birds (*Ploceus bengalensis*) from India, purchased; a Barbary Wild Sheep (*Ovis tragelaphus*), born in the Gardens.

OUR ASTRONOMICAL COLUMN.

RELATIONSHIP BETWEEN THE MASSES AND DISTANCES OF THE PLANETS.—In a previous number of NATURE (vol. lv. No. 1433) Mr. G. E. Sutcliffe, writing from Bombay, suggested a relationship between the masses and distances of the four superior planets. He found that when the masses and distance of each of the planets were multiplied together, the resulting numbers formed a series in geometrical progression having a common ratio of 1·8391, this latter number being nearly equal to the mean distance of Saturn (1·8338) when the mean distance of Jupiter is taken as unity. In a recent communication to us he has worked out the case of the inferior planets, with the result that the relationship of these planets to one another is not the same as obtained in the previous investigation. The ratios are still, however, in powers of the same value of R (the common ratio), namely 1·8391; and for this reason Mr. Sutcliffe suggests that this number is perhaps one of the constants of the solar system. In the same communication he gives a formula which expresses the mass of the sun in terms of the masses and distances of Venus, the earth and the moon, and from this he investigates the question of whether there is a planet which bears the same relationship to Jupiter that the earth and moon do to Venus. The mass, distance, and period of this hypothetical planet are given, but we doubt considerably its actual existence.

THE MADRAS OBSERVATORY.—Mr. C. Michie-Smith, the Government astronomer at Madras, tells us in his report for the year ending March 31, that, as regards the staff, the Government has sanctioned the revival of the appointment of a chief assistant. The past year has been conspicuous by the great amount of heavy rain, and both the director's and assistants' houses have suffered considerably. Observations for time have, as usual, been carried on, and the investigation for the determination of the divisions error of the Meridian Circle has been completed, no less than 72,192 micrometer readings being employed. The Madras Catalogue has further advanced, and the mean places for the first sixteen hours have been deduced. Proposals have been sanctioned for observing the total eclipse of the sun next January, and Karad has been fixed upon as the most suitable station.

STATIONS FOR OBSERVING THE TOTAL ECLIPSE OF THE SUN IN JANUARY 1898.

THE land path of the line of the total eclipse of the sun commences from a little south of Ratnagiri, on the Bombay coast, and runs in a north-easterly direction to Nepal, passing nearly over Mount Everest, and then disappears in Thibet. The shadow of the moon will therefore pass through parts of the Bombay Presidency, through Hyderabad, Berars, Central Provinces, and parts of Central India, Bengal, and North-west Provinces. The length of the path through India is about a thousand miles, and the width of the shadow roughly fifty miles. Hence the area from which observations *could* be taken is enormous. In India, however, facilities for travelling simply do not exist at all over by far the greater part of the country; and as accommodation for European travellers is even more scanty than the means of transport, the number of stations from which observations of the forthcoming eclipse are likely to be made is much smaller than would be expected. As the duration of the total phase of the eclipse on the central line decreases from about two minutes ten seconds on the Bombay coast, to about one minute forty seconds in parts of Bengal and the North-west Provinces, the natural tendency will be for observers to prefer the western stations. In addition, too, it would appear that the meteorological conditions are more favourable at the western than at the eastern or central stations on the line of totality.

The majority of travellers visiting India for the purpose of observing or seeing the total eclipse will land either at Bombay or Calcutta, probably at the former station. From Bombay several parts of the line of totality can be comfortably visited. The stations on the Bombay coast can be very easily reached by the local steamers of the Bombay Steam Navigation Company. As at present arranged, there is a daily passenger steamer to and from Bombay, calling at such ports as Ratnagiri and Viziadurg, which are close to the central line, and at Jaygad, which is close to the north limit of the line of totality, and at Dewgad, which if just within the southern limit. Combined passenger and cargo steamers also leave Bombay for some of these ports twice or three times weekly. The journey only takes from twelve to eighteen hours each way. The fares are cheap, the first-class fare from Bombay to Ratnagiri being seven rupees; the second, two rupees; and the third, one rupee four annas. It should be remembered that these fares do not include food; also that the steamers are small, even the combined passenger and cargo steamers having only about five cabins. Hence passengers should take their own bedding and food, and, for comfort's sake, should travel with their own servants.

Several other points on the line of totality can be reached by the railway from Bombay. Commencing with the lines of communication from the west side of India, the train can be taken *viâ* Kalyan Junction to Poona, passing through the Ghats. From Poona two lines diverge, one to Satara, which is a little north of the central line of totality and well within the northern limit, and from thence to Koregaon, &c., while the second line passes through Sholapur to Hyderabad, &c.; but on this second line there are no considerable stations within the line of totality, nor are there any towns within reasonable distance of the railway, though the smaller stations of Indapur and Kumbhargaon may be easily reached.

Another section of the line of totality can be visited from Bombay by the Great Indian Peninsular Railway *viâ* Kalyan Junction to Bhusawal Junction, proceeding thence to Amraoti, Pulgaon, Warda, and Nagpore. Pulgaon and Nagpore are said to be good stations for the purpose of observation. It should also be stated that Nagpore can be easily reached from Calcutta by the East Indian and Bengal Nagpore lines of railway, the latter railway being joined at Assensole Junction on the East Indian Railway.

Another section of the line of totality can be reached by continuing the journey by the Great Indian Peninsular Railway from Bhusawal Junction to Jubbalpore, where the East Indian Railway is joined, and then passing southwards from Katni by the Bilaspur branch. Again, this railway line crosses the path of the moon's shadow at a point where there are no towns of any importance.

The other parts of the line of totality which are crossed by the lines of railway could be reached either from Bombay by continuing the journey from Bombay to Allahabad, and then turning southwards on the East Indian main line, or more easily by making Calcutta the starting point, and proceeding northwards from there. The main line of the East Indian Railway crosses the line of totality from a little south of Benares to a little north of Arrah, the considerable station of Buxar being almost on the central line. There is also a small branch line leading to Ghazipur, which is said to be a good place for observations, and is also a fair-sized station. Again, leaving the East Indian Railway at Bankipore by means of the Bengal and North-western Railway, the path of the shadow can be easily visited, the considerable station of Chupra being near the southern limit. Again, by leaving the East Indian Railway at Mokameh, two sections of the shadow path can be reached by the Bengal and North-western and Tirhoot Railway, and the most considerable station on these two lines is Motiharee.

There are, therefore, eight sections of the path of the eclipse which are cut by various railways, in addition to the coast line which can be reached by the line of steamers: so that nine sections, or stations on the central line, could be easily occupied if necessary.

A considerable amount of local information as to sites suitable for observing parties has been collected by a committee of the Asiatic Society of Bengal at Calcutta,[1] and in connection with

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[1] Copies of the information collected could probably be obtained by application to the Honorary Secretary, Bengal Asiatic Society, 57 Park Street, Calcutta.